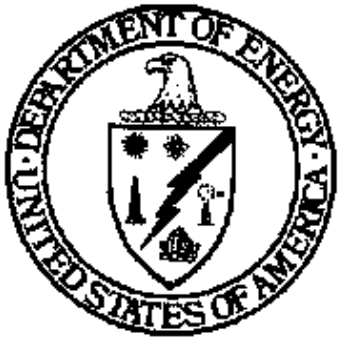
DOE/OR/21548-582
CONTRACT NO. DE-AC05-86OR21548

ENGINEERING SAMPLING PLAN TO IDENTIFY AREAS FOR REMEDIATION IN THE SOUTHEAST DRAINAGE (VICINITY PROPERTIES DA-4 AND DOC-7)

Weldon Spring Site Remedial Action Project
Weldon Spring, Missouri

NOVEMBER 1995 **REV. 0**



U.S. Department of Energy
Oak Ridge Operations Office
Weldon Spring Site Remedial Action Project

Prepared by MK-Ferguson Company and Jacobs Engineering Group

111095

MK-FERGUSON
A MORRISON KNUDSEN COMPANY

Weldon Spring Site Remedial Action Project
Contract No. DE-AC05-86OR21548

Rev. No. 0

PLAN TITLE: Engineering Sampling Plan to Identify Areas for Remediation in the Southeast Drainage (Vicinity Properties DA-4 and DOC-7)

APPROVALS

John R. Thompson
Data Administration Manager — 11/13/95 Date

Roger L. Workstation
Facilities Group Manager — 11/14/95 Date

Meyer
ES&H Manager — 11/14/95 Date

Philip D. Coate
Quality Assurance Manager — 11/22/95 Date

James R. Rowen
Project Director (or Deputy Project Director) — 11/22/95 Date

DOE/OR/21548-582

Weldon Spring Site Remedial Action Project

Engineering Sampling Plan to Identify Areas for Remediation in the Southeast Drainage (Vicinity Properties DA4 and DOC7)

Revision 0

November 1995

Prepared by

MK-FERGUSON COMPANY
and
JACOBS ENGINEERING GROUP
7295 Highway 94 South
St. Charles, Missouri 63304

for the

U.S. DEPARTMENT OF ENERGY
Oak Ridge Operations Office
Under Contract DE-AC05-86OR21548

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1 INTRODUCTION

This plan addresses a sampling program to gather additional data in the Southeast Drainage (Missouri Department of Conservation Property 7 and Department of the Army Property 4). The sampling program will include radiological survey techniques and soil sampling to more closely define the extent of radiological contamination throughout the drainage. This document does not address cleanup decisions for sediment and soil in the Southeast Drainage. The *Engineering Evaluation/Cost Analysis for the Proposed Removal Action at the Southeast Drainage Near the Weldon Spring Site* (Ref. 7) is being prepared for this purpose. The characterization activities described in this plan are focused on more closely defining areas to be remediated based on current evaluations of risk to human health and the environment.

1.1 Purpose and Objectives

This plan describes the radiological walkover surveys, soil sampling strategies, and analytical requirements that will be conducted in the Southeast Drainage to more closely delineate the lateral and vertical extent of radiological soil contamination to support engineering design for remediation of this area. The primary objective is to locate areas above 1×10^{-5} risk level for remediation and provide adequate engineering data. These data will be used to estimate the volume of soil that requires removal, prepare engineering designs, and determine the affected land surface areas. Most of the samples will be collected from areas that have been identified as areas of elevated concentrations through field screening techniques or at stream meander locations. In addition, other informational samples will be collected. Soil samples will be collected at seven locations in the drainage to identify and confirm polychlorinated biphenyl (PCB) concentrations found in composite soil samples taken in April 1995. One additional sediment sample will be collected at each of the four springs in the drainage and will be analyzed for nitroaromatics to determine whether these compounds are accumulating in the sediments in the groundwater discharge areas.

1.2 Scope

The scope of this plan encompasses (1) reviewing and analyzing existing soil radiological and chemical data to determine further data needs, (2) specifying requirements for walkover radiological surface surveys, (3) identifying field sampling procedures, (4) identifying sample

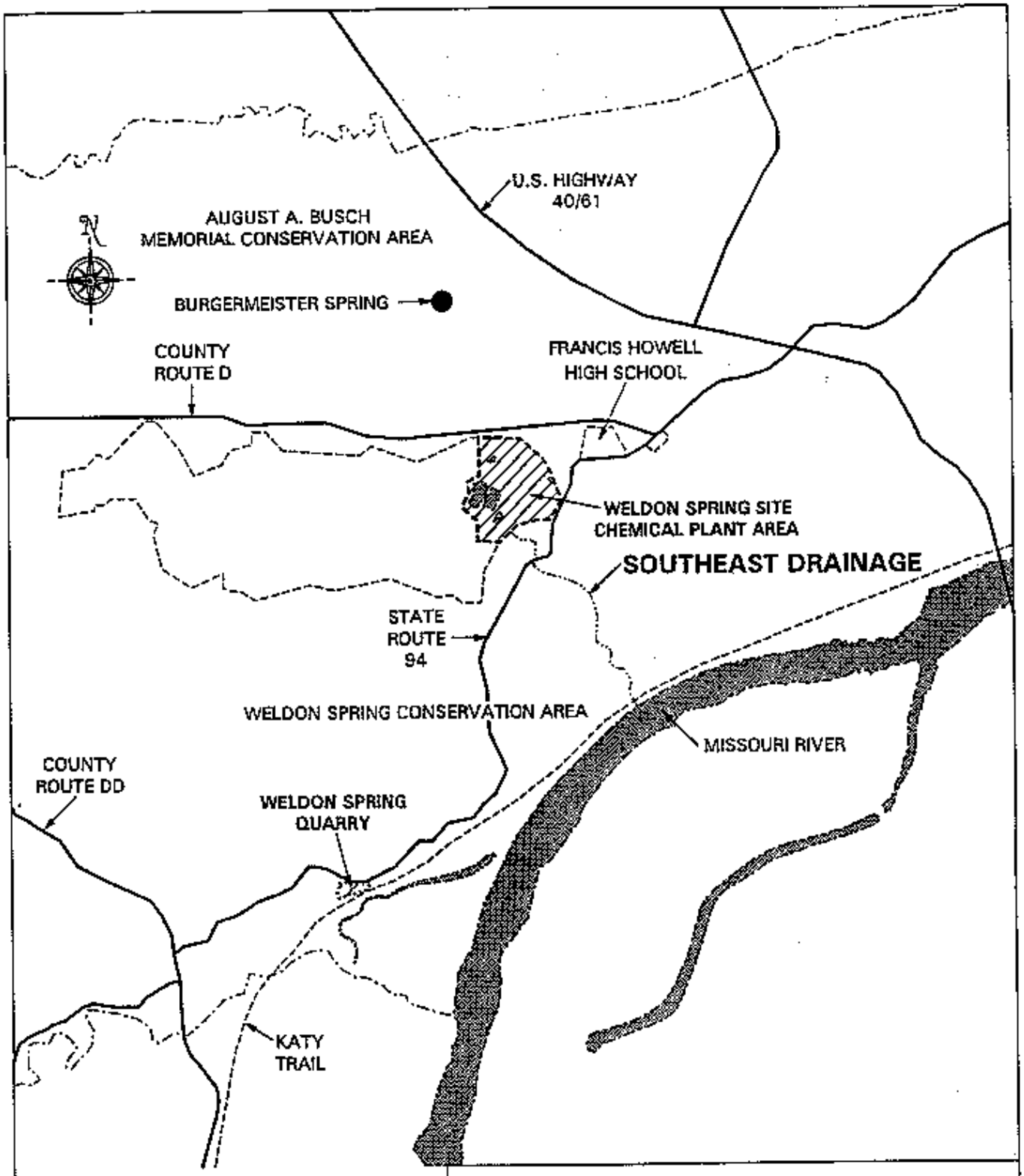
and data management requirements, (5) specifying quality assurance requirements, and (6) identifying specific sampling points for nitroaromatics and polychlorinated biphenyls. The volume of soil requiring removal and the cost of this action will be estimated based on the data and acceptable risk levels.

2 BACKGROUND

The Southeast Drainage is a natural drainage with intermittent flow that traverses the Weldon Spring Conservation Area from the Weldon Spring Chemical Plant to the Missouri River (Figure 2-1). The runoff flows through a 20 cm (7.9 in.) diameter underground pipe and surfaces approximately 200 m (78.7 in.) southeast of the chemical plant property fence line. During past uranium processing operations at the chemical plant, the Southeast Drainage received discharge from the sanitary and process sewers (Imhoff tank) and overflow from the raffinate pits. As a result, sediments and soils in the drainage are contaminated with uranium, thorium, and radium.

In 1985, the Oak Ridge Associated Universities (ORAU) conducted radiological surveys and sampling in the Southeast Drainage. A systematic soil sampling was conducted at 100 m (39.4 in.) intervals along the drainage and surface and subsurface soil samples were taken. In addition, a radiological walkover scan was conducted within the primary drainage channel using a sodium iodide meter. At locations where elevated meter readings were found, surface and subsurface samples were taken. From this survey, the Southeast Drainage was identified as vicinity properties DA4 and DOC7 (Figure 2-2).

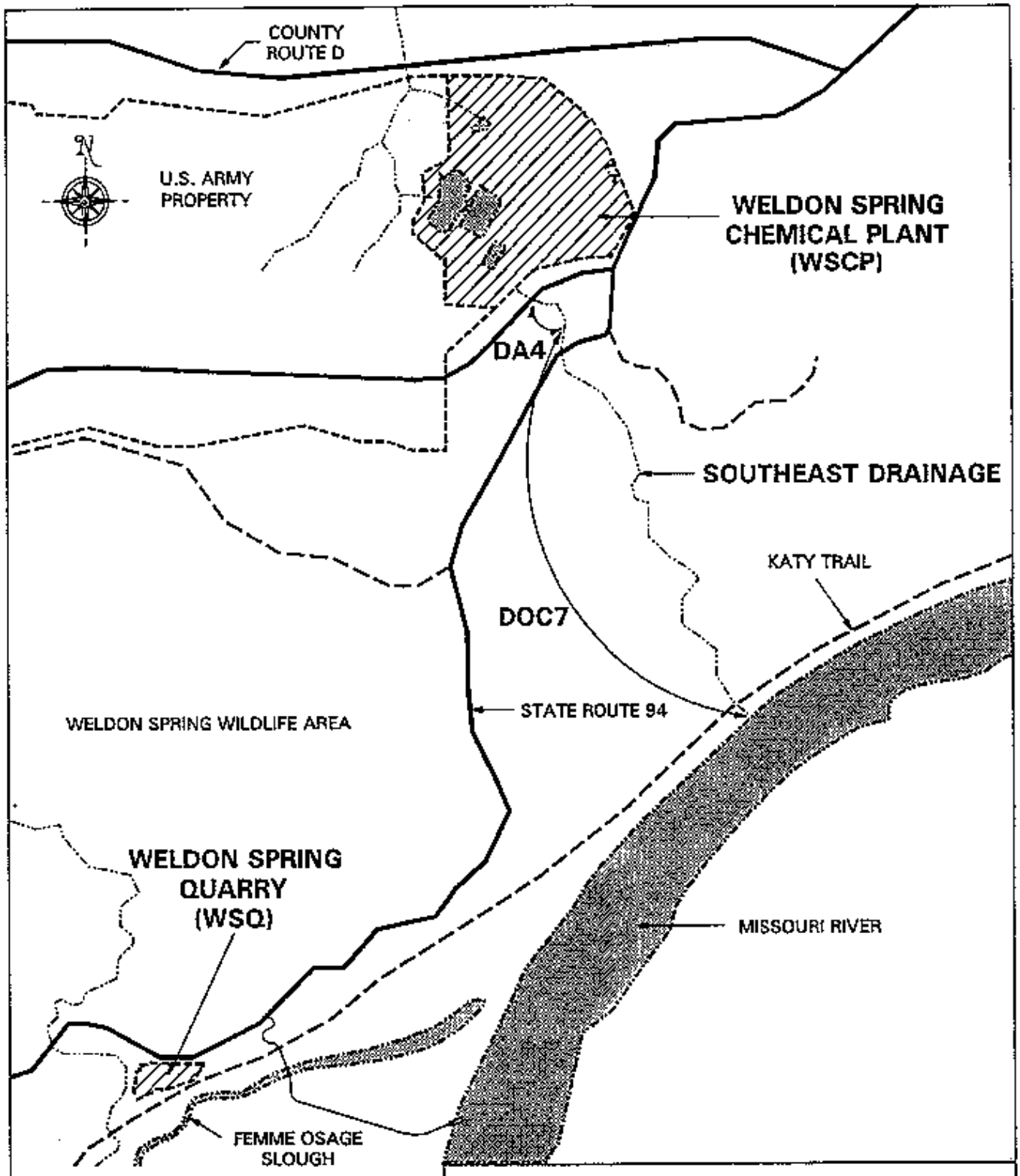
The soils review sampling (SRS) was conducted by the Project Management Contractor (PMC) in April, July, and August of 1995 (Ref. 8). The purpose of the sampling was to verify existing data and to gather additional characterization data. The first sampling was conducted to determine the current radiological concentrations at soil locations previously demarcated in 1985 by the Oak Ridge Associated Universities (ORAU) and to obtain additional chemical data. The second phase sampling was conducted to obtain additional soil samples at the lower portion of the drainage to provide additional radiological characterization data. The 1995 characterization program indicated that the highest radiological concentrations were found at four locations within DOC7. Maximum concentrations for each radionuclide at these locations were 742 pCi/g of U-238, 363 pCi/g of Ra-226, 326 pCi/g of Th-232, and 1919 pCi/g of Th-230. This range of concentration levels indicates that elevated concentrations of radiological compounds exist in soils to 30.5 cm (12 in.) in depth (Ref. 8). Concentrations are significantly higher than background (or random) concentrations, but are generally less than the concentrations reported by ORAU (Ref. 1 and Ref. 2), and isolated pockets or locations of soils with elevated concentrations occur throughout the drainage.



LOCATION OF THE SOUTHEAST DRAINAGE AND THE WELDON SPRING CHEMICAL PLANT AREA

FIGURE 2-1

REPORT NO: DOE/OR/21548-582	EXHIBIT NO: A/VP/019/0395	
ORIGINATOR: JR	DRAWN BY: GLN	DATE: 7/10/96



VICINITY PROPERTY DA4 & DOC7
SOUTHEAST DRAINAGE

FIGURE 2-2

REPORT NO.: DOE/OR/21548-582	EXHIBIT NO.: A/VP/020/0395	
ORIGINATOR: JR	DRAWN BY: GLN	DATE: 8/23/95

3 DATA QUALITY OBJECTIVES

Development of this sampling plan involves implementation of the Data Quality Objectives (DQO) process. DQOs are qualitative and quantitative statements that specify the quality of the data required to support decisions during remedial response activities.

3.1 DQO Development Process

The DQO development process for characterization sampling at the Southeast Drainage requires the completion of the seven steps summarized below. Sections 3.2 through 3.8 are a detailed discussion of each step of the DQO development process.

3.2 State the Problem

Define the lateral extent and depth of radiological contamination within elevated elevated concentrations in the soil and sample soils to determine those areas that require remediation for U-238, Ra-226, Ra-228, Th-232, and Th-230. In addition, sample stream meander locations, selected locations for polychlorinated biphenyls (PCBs) and spring sediments in order to quantify potential unknown conditions.

3.3 Identify the Decision

The decision is to determine if enough data is available to delineate lateral and vertical extent of isolated radiological elevated concentrations contamination in the Southeast Drainage, estimate the volume of soils to be removed, and to determine cost of such actions.

3.4 Study Inputs

Inputs include:

- U-238, Ra-226, Ra-228, Th-232, and Th-230 concentrations in the soil/sediment samples.
- Walkover surveys of entire area with 2x2 sodium iodide (NaI) detectors.
- In situ sodium iodide measurements in the 15.2 cm (6 in.) sample intervals.

3.5 Define the Boundaries of the Study

This study includes soils in the Southeast Drainage area, which runs from the Weldon Spring Chemical Plant boundary to the Missouri River and encompasses two designated vicinity properties (DA 4 and DOC 7).

3.6 Develop a Decision Rule

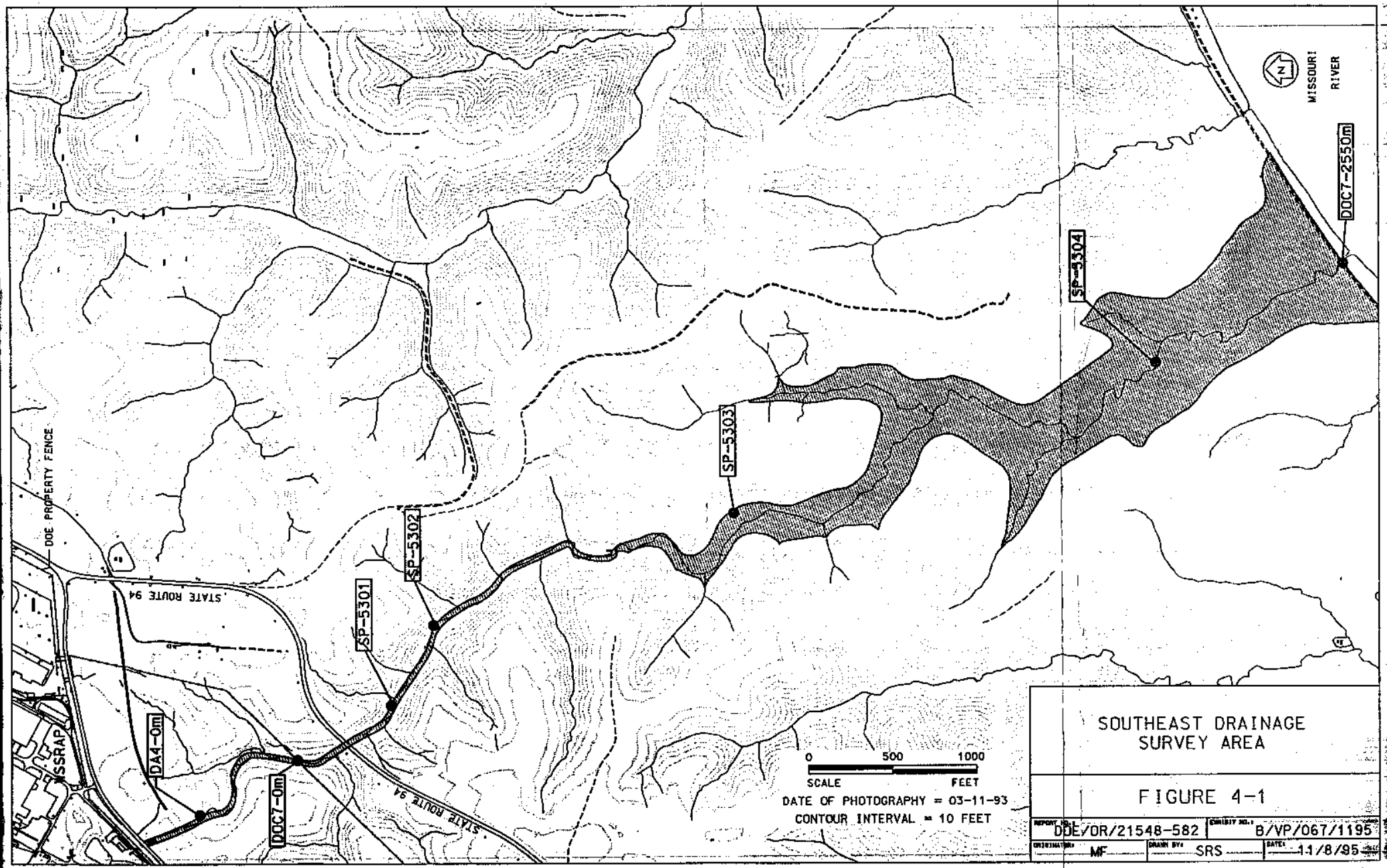
If enough data is not available to adequately define the extent of elevated concentrations contamination for remediation, then more samples will be collected. This decision is based upon the data collected. The definition of areas of elevated contaminant concentrations and estimation of contaminated soil volumes must be able to be determined within $\pm 25\%$ variance.

3.7 Developing Uncertainty Constraints

To minimize the potential for false negatives, the sample measured value plus two standard deviations, as determined from statistical counting error, field duplicates, and replicate analytical measurements, will be compared to the established cleanup levels for each radionuclide. The uncertainty on the boundary, as it pertains to engineering design, will be based on cost to overexcavate versus cost to continue sampling.

3.8 Optimize the Design

Field survey techniques will be used to identify contaminated areas and to estimate the lateral and vertical extent of contamination. When an elevated concentration is identified in accordance with the sampling plan presented in Section 4, a location survey (conventional or Global Positioning System [GPS]) will be used to identify the location coordinates. If the coordinates are within a 1 ft radius of a previous sampling point, a sample will not be collected. This methodology will be employed to minimize the number of samples collected and to maximize the probability of identifying the elevated concentrations areas.


MISSOURI RIVER
DOC7-2550m
SP-5304
SP-5303
SP-5302
SP-5301
DOE PROPERTY FENCE
STATE ROUTE 94
STATE ROUTE 94
DA4-0m
DOC7-0m
MSSRAP
0 500 1000
SCALE FEET
DATE OF PHOTOGRAPHY = 03-11-93
CONTOUR INTERVAL = 10 FEET
SOUTHEAST DRAINAGE SURVEY AREA
FIGURE 4-1
REPORT NO. DOE/OR/21548-582
EXHIBIT NO. B/VP/067/1195
ORIGINATOR MF
DRAWN BY SRS
DATE 11/8/95

VICINITY PROP	METER LOCATION	SAMPLE ID	COORDINATES	
			NORTH	EAST
DA4	0	0-10m	1041184[b]	754793[b]
	10	001	1041160	754807
	130	002	1040990	755003
	100	018	1040965	754909
	190	003	1040870	755158
	225	017	1040790	755153
	305	004	1040609	755118
	Om		1040606[b]	755122[b]
DOC7	13	016	1040523	755104
	65	005	1040419	755136
	SP-5301		1040052	755446
	225	006	1039943	755605
	300	019	1039839[b]	755809[b]
	SP-5302		1039802	755922
	365	007	1039763	755935
	440	008	1039544	756062
	485	009	1039412	756188
	510	010	1039400	756229
	600	020	1039149	756335
	685-700	032	1038963	756336
	730	011	1038836	756348
	810	012	1038621	756386
	900	021	1038378	756368
	1050	025	1038110	756434
	SP-5303		1038037	756590
	1660	027	1036613	757275
	1710	068	1036406	757174
	1730	067	1036354	757143
	1750	050	1036257	757136
	1840	066	1036026	757027
	1850	051	1035983	757051
	1915	065	1035909	757145
	1935	064	1035812	757260
	1950	052	1035820	757318
	2022	063	1035659	757365
	2030	028	1035625[a]	757400[a]
	2038	062	1035600	757437
	2050	053	1035562	757428
	2075	061	1035499	757475
	SP-5304		1035520	757492
	2120	060	1035520	757585
	2150	054	1035376	757678
	2175[b]	074	1035301	757707
	2200[b]	073	1035230	757682
	2240[b]	072	1035114	757680
	2250	055	1035104	757630
	2360[b]	071	1034845	757794
	2338	059	1034893	757800
	2350	056	1034851	757805
	2400[b]	070	1034628	757977
	2440	058	1034588	757962
	2450	057	1034573	757978
	2500	026	1034534	758027
	2550[b]	069	1034457	758080
	2550	030	1034553[b]	758211[b]
	KATY TRAIL		1034393	758087

LEGEND

a. The sample ids have a prefix of SO-495.

b. Estimated based on other defined locations

c. Estimated based on field notes.

SOUTHEAST DRAINAGE RADIOLOGICAL SAMPLE LOCATIONS AND COORDINATES

FIGURE 4-2

REPORT NO.	EXHIBIT NO.
DOE/OR/21548-582	A/PI/064/0595
ORIGINATOR: JXW	DRAWN BY: CRM
DATE: 11/7/95	

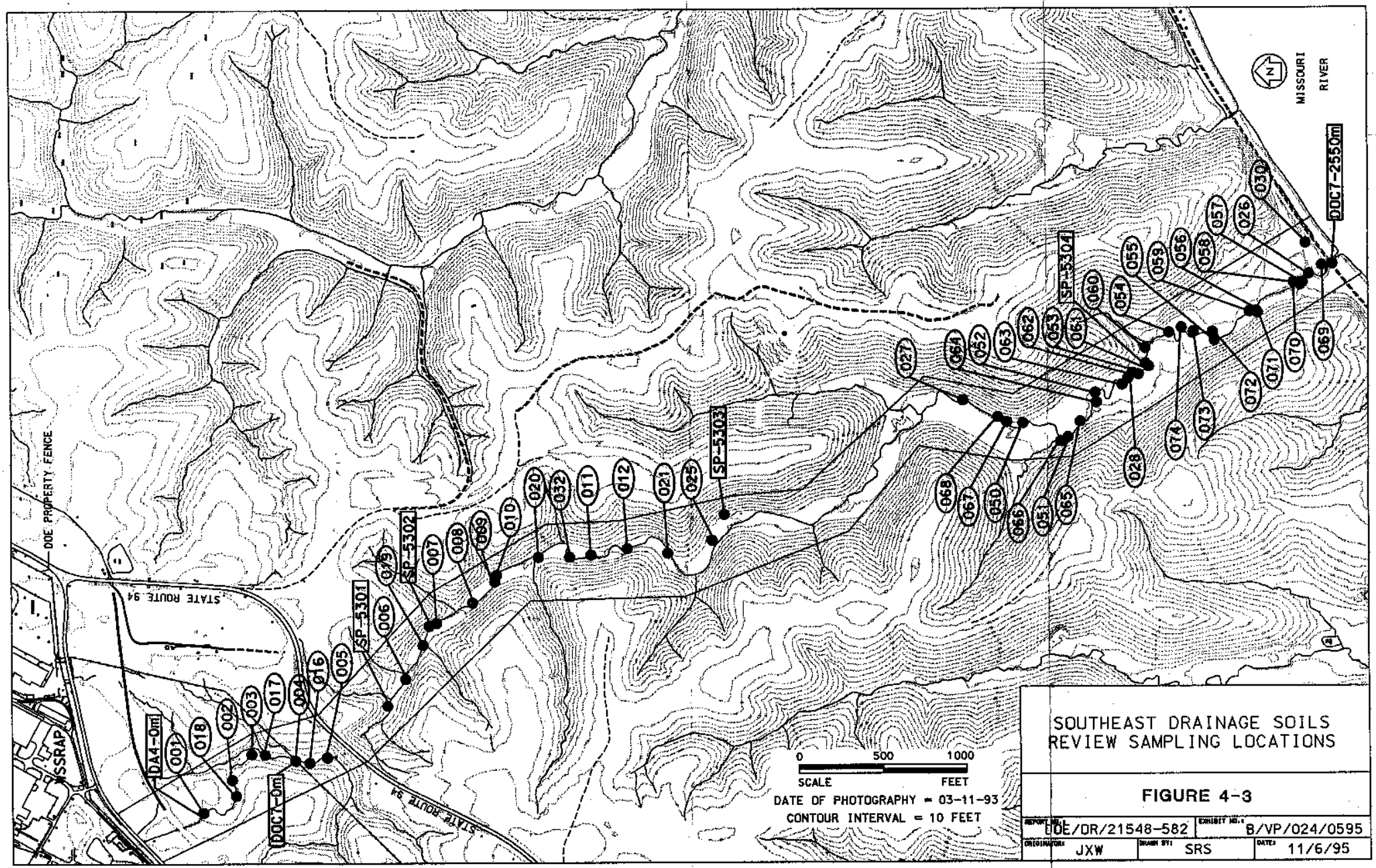
4 SAMPLING PLAN

The primary objective of this proposed sampling effort is to more closely define the lateral extent and depth of radiological contamination in the Southeast Drainage in order to provide data for estimating the volume of soil that requires removal, prepare engineering designs, and determine affected land surface areas. Additional soil samples will be taken for nitroaromatics and polychlorinated biphenyl (PCB) analyses.

4.1 Walkover Survey Techniques

The observational approach will be used to determine the majority of sample locations. The locations will be selected based upon measured results from screening techniques in the field. Walkover surveys will be conducted over the entire surface of the drainage according to Procedure ES&H 2.6.2, *Calibration and Use of Ludlum Model 44-10 (2 x 2 Sodium Iodide) Detector* as illustrated in Figure 4-1. A Ludlum Model 44-10 2x2 NaI scintillation probe coupled to a Ludlum Model 2220 ratemeter/scaler will be used to perform the walkover survey. Meters will be checked in daily and background readings will be obtained at areas known to be of background soil concentrations prior to the surveys within the drainage. The survey will be conducted by keeping the instrument probe within 30.5 cm (12 in.) of the ground while swinging the probe back and forth over the ground surface. The surveys will be conducted at a walking rate of 1 ft/second.

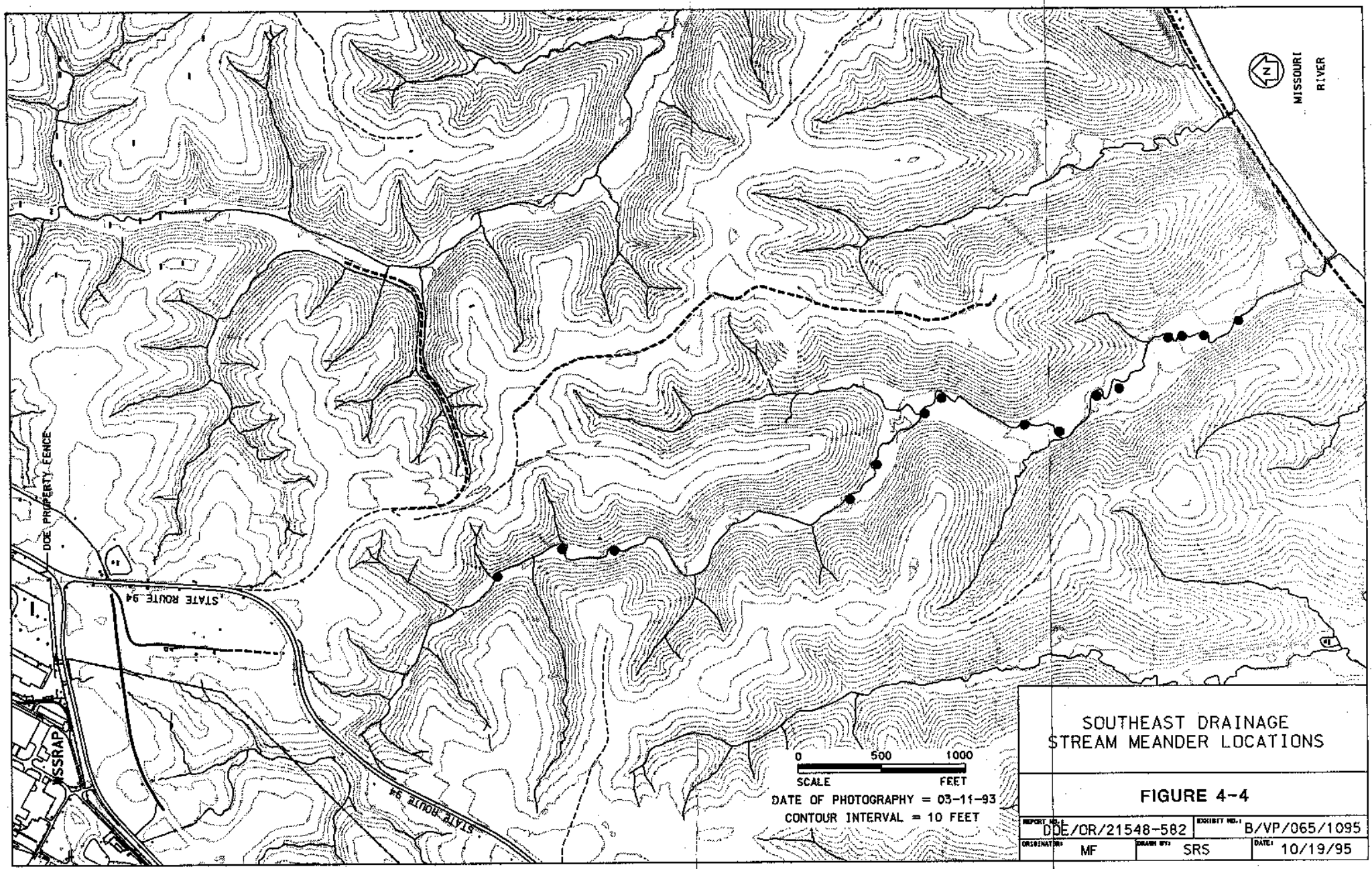
When areas are encountered with count rates greater than 1.5 times the instrument background reading, efforts will be made to delineate the boundaries of the elevated surface area (e.g., the boundary will be marked at the point the instrument response falls below 1.5 times the instrument background). These areas represent those where potential radiological elevated concentrations contamination is present. The surface area will be marked to indicate the lateral extent of contamination. The location within the bounded area yielding the highest instrument response will be located and marked for survey. This information, as well as any identifying characteristics of the soil type, will be recorded in the field logbook in accordance with Procedure ES&H 1.1.4, *The Logbook Procedure*. If the marked location corresponds to a point sampled during previous 1995 sampling efforts, a sample will not be collected and such information will be documented in the logbook. If the location does not correspond to a previous sampling point, the location will be sampled as indicated in Section 4.2. Figure 4-2



SOUTHEAST DRAINAGE SOILS REVIEW SAMPLING LOCATIONS

FIGURE 4-3

REPORT NO.: DOE/OR/21548-582		EXHIBIT NO.: B/VP/024/0595	
ORIGINATOR: JXW	DRAWN BY: SRS	DATE: 11/6/95	



SOUTHEAST DRAINAGE
STREAM MEANDER LOCATIONS

FIGURE 4-4

REPORT NO.: DOE/OR/21548-582	EXHIBIT NO.: B/VP/065/1095
ORIGINATOR: MF	DRAWN BY: SRS
DATE: 10/19/95	

provides a summary of previous 1995 sampling coordinates. These locations are illustrated in Figure 4-3.

4.2 Sample Locations

When areas have been designated for sampling by the walkover survey, samples will be collected from the locations designated as yielding the highest instrument response. Sampling will be performed in 15.2 cm (6 in.) increments until in situ gross gamma count rates fall below two and one half times the instrument background at the bottom of the sampling hole. The subsurface count rate is higher than the surface count rate due to the geometry involved when obtaining a subsurface measurement. All samples will be collected and field information recorded in accordance with Procedure ES&H 4.4.5, *Soil/Sediment Sampling*. Because of near-surface occurrences of bedrock, it may not be possible to collect subsurface samples (> 15.2 cm [> 6 in.]) in some parts of the drainage. Whenever possible, samples will be collected to bedrock or the point of refusal for the sampling equipment. All such information will be documented in the logbook.

In addition to samples collected in the identified areas of contamination through walkovers, samples will also be collected from potential buried stream meanders, at six random locations within each segment of the drainage, and at the four springs located within the drainage. A review of existing data indicated the need for sampling stream meanders due to the potential for buried contamination. The stream meanders were identified through comparison of overhead flight pictures from previous plant operations and the current layout of the drainage way. Fifteen areas have been identified in the drainage. Samples will be collected from these general locations as provided in Figure 4-4 and as based on field characteristics. The coordinates for these locations are provided in Figure 4-5. An engineering survey crew will mark these locations prior to sample collection and samples will be taken to bedrock.

Additional characterization data will be collected to confirm concentrations of nitroaromatics and PCBs. Samples will be collected from seven locations as listed in Table 4-1. These locations and coordinates are also provided in Figures 4-2 and 4-3. A GPS or engineering survey crew will mark these locations prior to sample collection and

TABLE 4-1 Soil Sampling Locations for PCB Analysis

Vicinity Property	Meter Location	Previous Sample ID	Coordinates	
			North	East
DA 4	130	002	1040990	755003
DA 4	190	003	1040870	755158
DA 4	305	004	1040609	755118
DOC 7	65	005	1040419	755136
DOC 7	1050	025	1038110	756434
DOC 7	1660	027	1036613	757275
DOC 7	2030	028	1035625	757400

NORTH	EAST
1039382.94	756224.34
1039003.26	756387.67
1038689.26	756376.46
1037278.02	756679.05
1037114.27	756887.88
1036829.69	757192.65
1036730.31	757284.09
1036234.39	757122.88
1036021.14	757081.72
1035797.59	757293.41
1035664.35	757338.24
1035367.78	757642.92
1035283.95	757651.74
1035154.52	757654.68
1034944.31	757742.82

NOTE:
STREAM MEANDER COORDINATE POINTS CORRESPOND TO DOTS ON THE SOUTHEAST DRAINAGE SAMPLING LOCATION MAP IN NORTH TO SOUTH ORDER.

SOUTHEAST DRAINAGE
STREAM MEANDER
LOCATION POINT
COORDINATES

FIGURE 4-5

REPORT NO.	EXHIBIT NO.
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ORIGINATOR	DRAWN BY	DATE
MF	CRM	10/13/95

samples will be taken from 0-15.2 cm (0-6 in.) and 15.2 - 30.5 cm (6-12 in.) in depth and analyzed individually for PCBs.

Sediment samples will also be collected from each of the four springs, 5301 to 5304, as illustrated on Figure 4-3. Samples will be taken from 0-15.2 cm (0-6 in.) and 15.2-30.5 cm (6-12 in.) in depth and analyzed individually for nitroaromatics.

4.3 Sample Collection

Soil samples for radiological and chemical analyses will be collected using hollow stem or motorized augers. All sample collection will be performed in accordance with Procedure ES&H 4.4.5, *Soil/Sediment Sampling*. Large rocks, gravel, roots, and other debris (wood) will be removed from the sample prior to placing in sample containers. Sample homogenization, if necessary, will be performed in accordance with Procedure ES&H 2.5.5, *Sample Preparation Procedure for Radiological Soil Samples*. Samples will be placed in glass or plastic sample containers as required for the specific parameters. Samples will be collected at each 6 in. depth intervals and analyzed as separate samples. Therefore, at each location, samples will be taken 0-15.2 cm (0-6 in.) 15.2-30.5 cm (6-12 in.) etc. until auger refusal. For each of the samples, the following containers will be used: 17 oz (500 ml) amber glass wide mouth jar for polychlorinated biphenyls (PCBs), 8.5 oz (250 ml) amber glass jar for nitroaromatics and approximately 2.2 lbs (1,000 g) of soil in a plastic Ziplock bag for radiological parameters.

Sample labels will be completed and attached to all containers prior to placement into secondary containers (e.g., coolers, backpacks, etc.). Labeling of containers will be done in accordance with Procedure ES&H 4.1.1, *Numbering System for Environmental Samples and Sampling Locations*. Sample numbering will follow the designation of SO-495XXX-YY where XXX follows a chronological sequence based upon other samples collected in off-site locations and YY designates the sampling depth interval (e.g., 01=0-15.2 cm [0-6 in.], 02=15.2-30.5 cm [6-12 in.], etc.). Sample numbering will not be done prior to sample collection due to the observational approach used in determining number and location of samples. Sample locations, samples collected, and related data will be recorded in the field logbook, at the time of collection, in accordance with procedure ES&H 1.1.4 and on the soil sampling data sheet as per ES&H 4.4.5. In addition, soils will be visually examined and field notes will document any variations in the soil types during sampling.

Chain of custody forms for laboratory samples will be completed and placed in the sample coolers or other secondary containers. Sample containers prepared for shipment to off-site vendors will be sealed with chain of custody control seals signed and dated by the shipper. Chain of custody forms and seals will be prepared in accordance with Procedure ES&H 4.1.2, *Initiation, Generation, and Transfer of Environmental Chain of Custody.* Completed chain of custody documents will be retained as QA records and maintained in accordance with the Weldon Spring Site Remedial Action Project (WSSRAP) quality assurance program (Section 5).

4.4 Equipment Decontamination

All sampling equipment will be cleaned and decontaminated before each sample is collected. Tools used to transfer soil samples from the sampling equipment to the sample containers will also be cleaned and decontaminated before each sample is collected. All decontamination will be performed in accordance with Procedure ES&H 4.1.3, *Sampling Equipment Decontamination.*

4.5 Sample Analyses, Analytical Techniques and Data Management

Samples collected from elevated areas of contamination and from potential buried stream meanders will be analyzed for U-238, Ra-226, Ra-228, Th-232, and Th-230. If laboratory capacity warrants timely turnaround, the U-238, Ra-226, Ra-228, and Th-230 (screening) analyses will be performed by the on-site radiological laboratory using approved methodologies (high purity germanium gamma spectroscopy) in accordance with Procedure ES&H 2.6.9, *Instructions for Calibration and Operation of High Purity Germanium Detector.* If the on-site laboratory is used, all samples will be sent off site for isotopic thorium identification by alpha spectroscopy in order to better quantify Th-232 and Th-230 concentrations. If the on-site laboratory is not available, due to other project priorities, the samples will be analyzed through off-site providers for the radiological constituents identified previously. Samples collected for additional characterization information (the select locations and the springs) will be sent to off-site laboratories for nitroaromatics and PCB analyses.

Detection limits and methodologies are presented in Appendix A (Data Quality Requirements) of the *Sample Management Guide* (Ref. 3). Review and management of the analytical data is specified in the *Sample Management Guide*. All analytical data, both on site

and off site, are verified and a portion of these data undergo validation as required in the *Sample Management Guide* (Ref. 3). These processes are discussed more thoroughly in the following sections.

4.5.1 Data Verification

All sample analytical results received from the laboratory will be reviewed in accordance with ES&H 4.9.1, *Environmental Monitoring Data Verification*. The following factors will be evaluated to verify if a sample has been properly handled according to WSSRAP protocol:

- Chain of custody
- Holding times
- Sample preservation requirements
- Laboratory chain of custody
- Sample analysis request form
- Quality control samples
- Laboratory receipt forms

4.5.2 Data Review

Copies of the data packages will be distributed to the data users for their review. The data will be reviewed to identify discrepancies in the field quality control samples, inconsistencies with characterization data, and apparent abnormalities. Deficiencies reported by data users will be reported to the Verification Group. Data users may request validation of any data that appear to be of questionable quality. This review will be done in accordance with ES&H Procedure 4.9.3, *Data Review Procedure for Surface Water, Groundwater, and Soils*.

4.5.3 Data Validation

Randomly selected laboratory data and data selected by verification or data users will undergo thorough reviews of the analytical process in accordance with ES&H 4.9.2, *Environmental Monitoring Data Validation*. These reviews will be conducted by the Validation Group.

The purpose of this validation procedure will be to specify a consistent means for reviewing and evaluating the data resulting from laboratory analyses and for providing a consistent means of documenting the evaluations and reporting the usefulness of the data to the data users. This will be accomplished through a thorough review of the analytical data using laboratory analytical records to assess laboratory conformance to quality control criteria, data quality requirements for data quality objectives, and procedural requirements.

5 QUALITY ASSURANCE

MK-Ferguson Company, the Project Management Contractor (PMC) at the Weldon Spring Site Remedial Action Project (WSSRAP), has developed the *Project Management Contractor Quality Assurance Program* (QAP) (Ref. 4) in accordance with DOE Order 5700.6C. The PMC QAP applies a graded approach to ensure that activities performed at the WSSRAP are of documented quality.

The QAP is supported by site quality procedures that direct the evaluation of quality-affecting activities by implementing independent assessments and processes to identify nonconforming conditions and to ensure corrective actions.

The PMC has developed the *Environmental Quality Assurance Project Plan* (Ref. 5) to ensure that all environmental activities conducted at the WSSRAP are performed in accordance with U.S. Environmental Protection Agency QAMS-005/80 (Ref. 6).

5.1 Analytical Procedures

The off-site quantitative laboratory conducting radiological and chemical analysis for the final status survey samples has submitted controlled copies of its site-specific *Quality Assurance Project Plan* (QAPjP) and standard operating procedures (SOPs). This plan and these SOPs have been reviewed and accepted by the PMC. The WSSRAP and contract laboratory SOPs direct the accepted standards and methodologies for performing analytical processes, operations and activities. The laboratory QAPjP and SOPs specify quality control requirements to demonstrate the precision, representativeness, and accuracy of the analytical data.

All data generated by analytical activities (i.e., calculations, chromatographs, calibration curves, quality assurance analyses) are quality assurance (QA) records and will be maintained in accordance with the quality assurance program.

Maintenance and storage of completed records, charts, and logs of all pertinent calibrations, analyses, quality control activities, and data generated by the laboratory will be kept in a WSSRAP-specific project file. Both electronic and hard-copy data reports must be available

at the laboratory's facilities for 3 years after termination or expiration of any contract. Storage areas must keep records safe from damage by moisture or fire.

5.2 Internal Quality Control Checks

Quality control samples will be collected to ensure consistent and accurate performance of sample collection and laboratory analysis. Table 5-1 provides a summary list of the quality control samples that will be collected to support the final survey.

TABLE 5-1 Field Quality Control Sample Summary

QUALITY CONTROL SAMPLE TYPE	FREQUENCY	PURPOSE
Matrix Spike/Matrix Spike Duplicate or Matrix Duplicate	1 per 20 or 1 per 14 days[a]	Assess matrix and possible interlaboratory variability
Field Replicate	1 per 20	Assess matrix and interlaboratory variability
Equipment Blank (nondedicated equipment only)	1 per 20	Assess effectiveness of decontamination
Deionized Water Blank[b]	1 per month	Assess quality of deionized water
Field Blank[b]	1 per month	Assess impact of ambient conditions on samples

(a) Whichever is of higher frequency.
(b) Collected together on the same day.

5.2.1 Quality Assurance Records

Records generated as a result of this plan will be maintained as QA records. Field sampling forms, analytical data, equipment calibration records, and confirmation and validation documentation records will all be considered QA records and will be maintained in accordance with the requirements of SQP-7, *Quality Assurance Records*. This will provide both security and protection to critical records.

6 HEALTH AND SAFETY

All sampling activities will be conducted according to health and safety practices required for on-site sampling activities. A daily Task Specific Safety Analysis (TaSSA) will be prepared, reviewed, approved, and filed with Construction Management and Operations Department prior to sample collection. An excavation permit will also be obtained for this work. If required, a Contamination Control Work Permit (CCWP) will also be submitted with the TaSSA. The CCWP will outline proper applicable personnel protective equipment for the sampling event. Safety and Environmental Safety and Health (ES&H) personnel may monitor health and safety conditions during sampling activities and will monitor sample collection personnel and equipment in areas with elevated radiological contamination.

7 REFERENCES

1. Boerner, A.J. *Radiological Survey of the August A. Busch and Weldon Spring Wildlife Areas Weldon Spring Site, St. Charles County, Missouri*, Final Report. Prepared by Oak Ridge Associated Universities, for U.S. Department of Energy, Division of Remedial Action Projects. April 1986.

2. Deming, E.J. *Radiological Survey U.S. Army Reserve Property Weldon Spring Site, St. Charles County, Missouri*, Final Report. Prepared for U.S. Department of Energy, Division of Remedial Action Projects, by Oak Ridge Associated Universities. January 1986.

3. MK-Ferguson Company and Jacobs Engineering Group. *Sample Management Guide*. Rev. 0. DOE/OR/21548-499. Prepared for the U. S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. March 1995.

4. MK-Ferguson Company and Jacobs Engineering Group. *Project Management Contractor Quality Assurance Program*, Rev. 1. DOE/OR/21548-333. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. November 1994.

5. MK-Ferguson Company and Jacobs Engineering Group. *Environmental Quality Assurance Project Plan*, Rev. 1. DOE/OR/21548-352. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. July 1993.

6. U.S. Environmental Protection Agency, Office of Monitoring Systems and Quality Assurance. *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans*, QAMS-005/80. Washington, D.C. December 29, 1980.

7. Argonne National Laboratory, Environmental Assessment Division. *Engineering Evaluation/Cost Analysis for the Proposed Removal Action at the Southeast Drainage Near the Weldon Spring Site, Weldon Spring, Missouri*. DOE/OR/21548-584. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, Missouri. October 1995.

8. MK-Ferguson Company and Jacobs Engineering Group. *Southeast Drainage Soils Review Sampling Report*, Rev. 0. DOE/OR/21548-559. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, Missouri. November 1995.

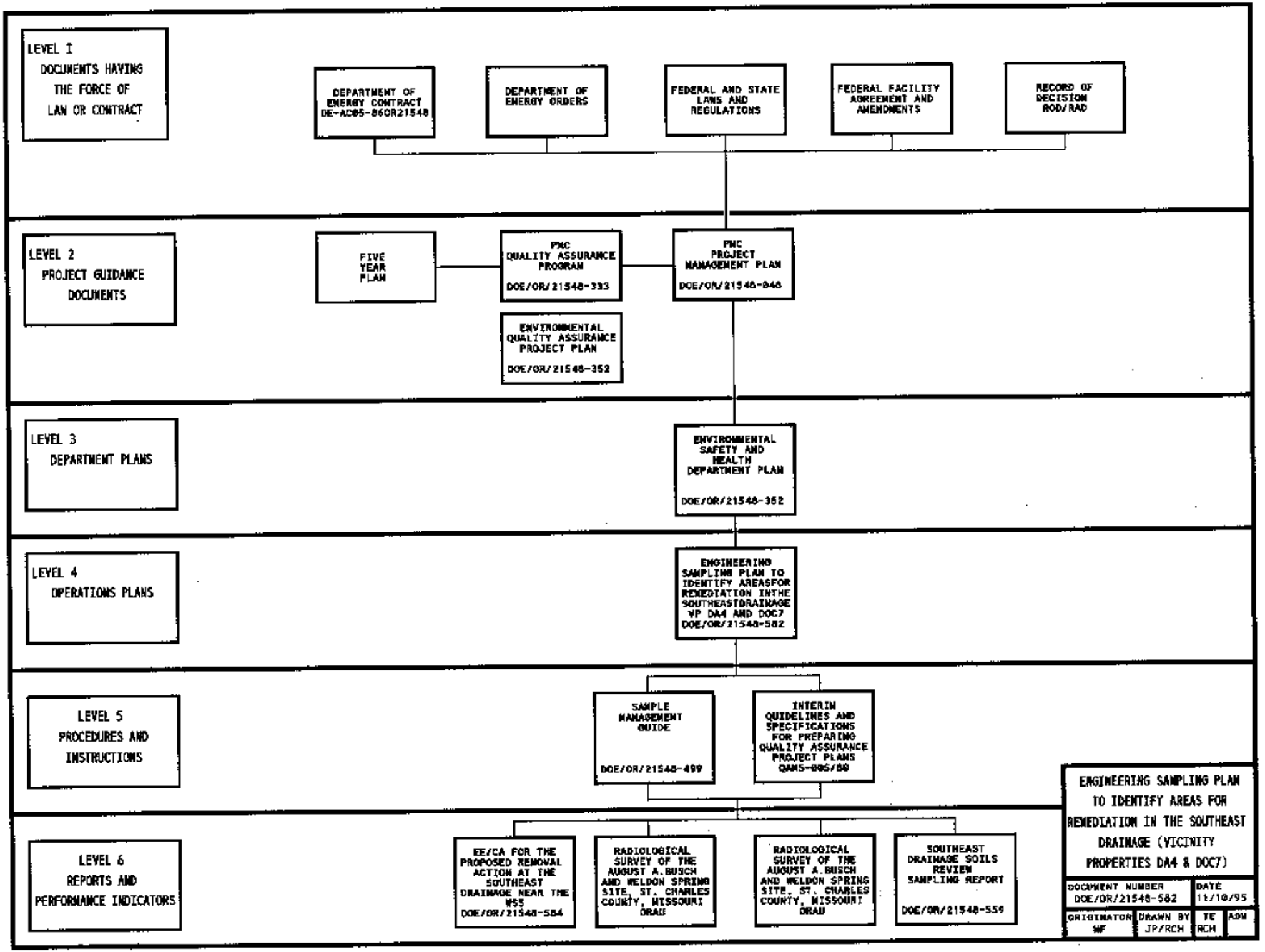
DOE ORDERS

5700.6C, *Quality Assurance Program A Total Management System*

PROCEDURES

ES&H 1.1.4, *Logbook Procedures*
ES&H 2.5.5, *Sample Preparation for Radiological Soil Samples*
ES&H 2.6.2, *Calibration and Use of Ludlum Model 44-10 (2x2 Sodium Iodide) Detector*
ES&H 2.6.9, *Instructions for Calibration and Operation of High Purity Germanium Detector*
ES&H 4.1.1, *Numbering System for Environmental Samples and Sampling Locations*
ES&H 4.1.2, *Initiation, Generation, and Transfer of Environmental Custody*
ES&H 4.4.5, *Soil/Sediment Sampling*
ES&H 4.9.2, *Environmental Monitoring Data Validation*
ES&H 4.9.3, *Data Review Procedure for Surface Water, Groundwater, and Soils*
SQP-7, *Quality Assurance Records*

APPENDIX A
Document Hierarchy


LEVEL 1
DOCUMENTS HAVING THE FORCE OF LAW OR CONTRACT
DEPARTMENT OF ENERGY CONTRACT DE-AC05-86OR21548
DEPARTMENT OF ENERGY ORDERS
FEDERAL AND STATE LAWS AND REGULATIONS
FEDERAL FACILITY AGREEMENT AND AMENDMENTS
RECORD OF DECISION ROD/RAD
LEVEL 2
PROJECT GUIDANCE DOCUMENTS
FIVE YEAR PLAN
PMC QUALITY ASSURANCE PROGRAM
DOE/OR/21548-333
PMC PROJECT MANAGEMENT PLAN
DOE/OR/21548-848
ENVIRONMENTAL QUALITY ASSURANCE PROJECT PLAN
DOE/OR/21548-352
LEVEL 3
DEPARTMENT PLANS
ENVIRONMENTAL SAFETY AND HEALTH DEPARTMENT PLAN
DOE/OR/21548-362
LEVEL 4
OPERATIONS PLANS
ENGINEERING SAMPLING PLAN TO IDENTIFY AREASFOR REMEDIATION INTHE SOUTHEASTDRAINAGE VP DA4 AND DOC7
DOE/OR/21548-582
LEVEL 5
PROCEDURES AND INSTRUCTIONS
SAMPLE MANAGEMENT GUIDE
DOE/OR/21548-499
INTERIM QUIDELINES AND SPECIFICATIONS FOR PREPARING QUALITY ASSURANCE PROJECT PLANS
QAMS-005/80
LEVEL 6
REPORTS AND PERFORMANCE INDICATORS
EE/CA FOR THE PROPOSED REMOVAL ACTION AT THE SOUTHEAST DRAINAGE NEAR THE W55
DOE/OR/21548-584
RADIOLOGICAL SURVEY OF THE AUGUST A.BUSCH AND WELDON SPRING SITE, ST. CHARLES COUNTY, MISSOURI
ORAU
RADIOLOGICAL SURVEY OF THE AUGUST A.BUSCH AND WELDON SPRING SITE, ST. CHARLES COUNTY, MISSOURI
ORAU
SOUTHEAST DRAINAGE SOILS REVIEW SAMPLING REPORT
DOE/OR/21548-559
ENGINEERING SAMPLING PLAN TO IDENTIFY AREAS FOR REMEDIATION IN THE SOUTHEAST DRAINAGE (VICINITY PROPERTIES DA4 & DOC7)
DOCUMENT NUMBER DOE/OR/21548-582
DATE 11/10/95
ORIGINATOR WF
DRAWN BY JP/RCH
TE RCH
ADM